

BFORE: A balloon-borne experiment to characterize large-scale CMB polarization anisotropies and measure high frequency polarized and unpolarized foregrounds

Active Technology Project (2018 - 2022)

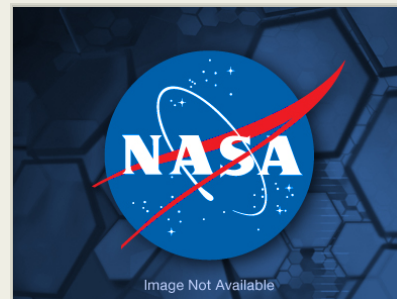


Project Introduction

We propose to build a B-mode Foreground Experiment (BFORE) and fly it on a NASA ultra-long duration balloon from New Zealand. The BFORE experiment will map 20,000 square degrees in four bands (150, 220, 280 and 350 GHz) with a map sensitivity to polarization at each frequency 3-5 times deeper than the ESA PLANCK satellite. We propose to obtain this data in a single flight in spring 2021 corresponding to the time scale when the next generation ground-based instruments will be completing their initial surveys. BFORE's combination of frequency coverage, sky coverage and angular resolution enables a range of science goals. The combination of BFORE and existing low frequency survey data from WMAP, PLANCK and ground-based experiments will enable an improved measurement of the optical depth to recombination, τ , constrain models of reionization and enable precise measurements of the neutrino masses. BFORE will also characterize the properties of the dust polarization with a precision sufficient to clean lower frequency B-mode polarization data to a level corresponding to a tensor to scalar ratio of $r < 0.01$. In addition, the combination of the frequency coverage and angular resolution of BFORE will enable peculiar velocity measurements or constraints on thousands of galaxy clusters, opening a new window into the evolution of large scale structure. Finally, by probing the dust polarization in the diffuse Interstellar Medium (ISM), BFORE will examine the role the magnetic fields play in the formation of stars and large-scale filaments in our Galaxy.

Anticipated Benefits

The Astrophysics Research and Analysis program (APRA) supports suborbital and suborbital-class investigations, development of detectors and supporting technology, laboratory astrophysics, and limited ground based observing. Basic research proposals in these areas are solicited for investigations that are relevant to NASA's programs in astronomy and astrophysics, including the entire range of photons, gravitational waves, and particle astrophysics. The emphasis of this solicitation is on technologies and investigations that advance NASA astrophysics missions and goals.

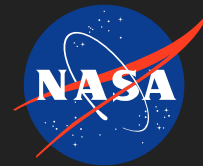


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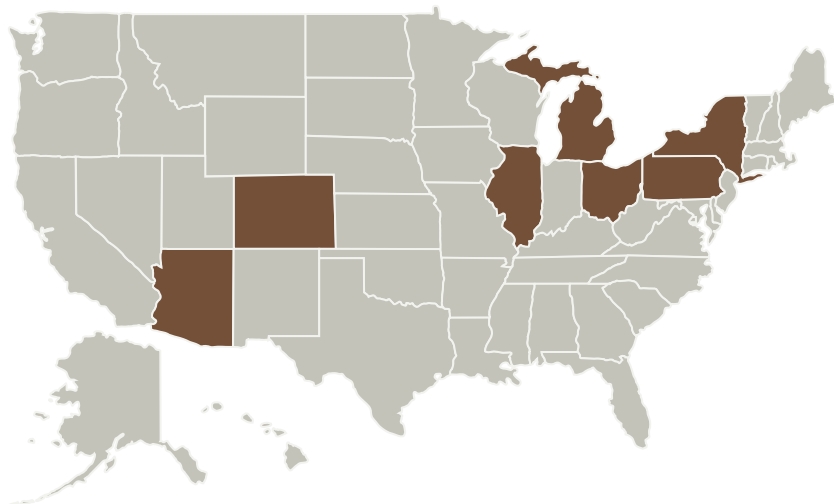
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Primary U.S. Work Locations and Key Partners



Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Organization:

Arizona State University-Tempe (ASU)

Responsible Program:

Astrophysics Research and Analysis

Project Management

Program Director:

Michael A Garcia

Program Manager:

Dominic J Benford

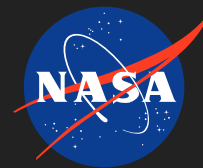
Principal Investigator:

Philip Mauskopf

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Organizations Performing Work	Role	Type	Location
Arizona State University-Tempe(ASU)	Lead Organization	Academia	Tempe, Arizona
Cardiff University	Supporting Organization	Academia	Cardiff, Outside the United States, United Kingdom
Cornell University	Supporting Organization	Academia	Ithaca, New York
Institut d'Astrophysique Spatiale	Supporting Organization	Industry	Orsay, Outside the United States, France
La Sapienza università di Roma	Supporting Organization	Academia	Roma, Outside the United States, Italy
Max-Planck-Institut für Astronomie(MPIA)	Supporting Organization	Industry	
National Institute of Standards and Technology(NIST)	Supporting Organization	US Government	Boulder, Colorado
Northwestern University	Supporting Organization	Academia	Evanston, Illinois

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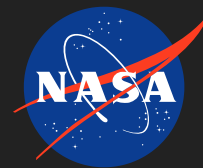
Project Management (cont.)

Co-Investigators:

Mark J Devlin
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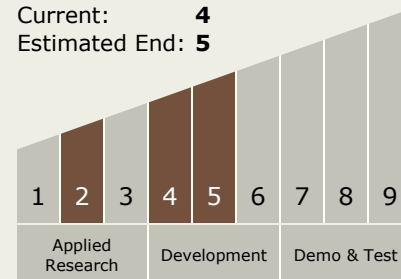
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Organizations Performing Work	Role	Type	Location
Office for Research and Sponsored Projects Administration - Arizona State University(ORSPA)	Supporting Organization	Academia	Tempe, Arizona
University of British Columbia	Supporting Organization	Academia	Vancouver, Outside the United States, Canada
University of Illinois at Urbana-Champaign	Supporting Organization	Academia	Urbana, Illinois
University of Michigan-Ann Arbor	Supporting Organization	Academia	Ann Arbor, Michigan
University of Pennsylvania	Supporting Organization	Academia	Philadelphia, Pennsylvania
University of Toronto	Supporting Organization	Academia	Toronto, Canada

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - ↳ TX08.X Other Sensors and Instruments

Target Destination

Outside the Solar System

Primary U.S. Work Locations

Arizona	Colorado
Illinois	Michigan
New York	Ohio
Pennsylvania	